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A *BATHYMERMIS* SPECIES (MERMITHIDAE: NEMATODA) PARASITIC ON LARVAL TABANIDS

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A species of Bathymermis *Daday 1911, is reported as a parasite of larval* Chrysops furcata *Walk. Transmission of the parasite from infected soil to* Chrysops mitis *O. S. was accomplished in the laboratory. The parasitic larvae were reared from the hosts. The pathology of the mermithid is described and its possible use as a means of biological control for tabanids is discussed.*

Larval tabanids were collected during 1958-1961 from the following three areas in Alberta: Winterburn swamp, 8 miles west of Edmonton; a grassy lake at Raymond and Welling, south of Lethbridge; two irrigation ditches near Waterton. The nematodes were first encountered during the spring of 1959. Since then all collections were examined for infected larvae. These groups of larvae were maintained individually in separate vials containing moist soil from their respective habitats. The larvae were of several species and ranged from 10-30 mm long. Natural infection was present only in *Chrysops furcata* Walk. and from only one of the collecting sites (Table 1). Usually only one parasite was obtained from a single larva although up to five were recorded.

TABLE 1 - Incidence of *Bathymermis* sp. in larval tabanids in Alberta, Canada, 1958-1960.

Species - Place	Date	No.	Infection %	Date	No.	Infection %
C. furcata						
Winterburn	Oct. 1958	2	-	Jun. 1959	150	23
	Aug. 1959	78	27	Jun. 1960	156	28
	Jul. 1960	125	16	Aug. 1960	20	35
	Sept. 1960	16	37			
T. reinwardtii, Raymond & Welling				Oct. 1958	70	-
C. mitis, Vauxhall	Sept. 1959	183	-	Oct. 1960	221	-
C. mitis, Waterton	Sept. 1959	125	-			

Usually the nematodes were separated from the host's tissue and fixed in hot 70% alcohol with 5% glycerine for further study; more rarely

hot formalin was used as a fixative. Living specimens of the parasite after emergence from the host's body and from the soil were either examined alive or after clearing with glycerine and lactophenol. The salt flotation technique (Chandler 1952) was often used for soil examination for the nematode eggs.

It was usually noticed that when larval *C. mitis* O.S. were maintained in the soil collected from the Winterburn swamp area, they suffered from the nematode parasites. Two healthy batches of ten *C. mitis* larvae were maintained in the infected soil. About 70% of these larvae developed infection which became apparent after about 23 days.

NOTES ON THE LIFE-CYCLE AND PATHOLOGY

Dead larvae with signs of recent parasitisation were most numerous in early July. Emergence, however, continued until September, as parasitised larvae were still available then.

Several nematodes were seen to emerge head foremost either through the thoracic segments or the last abdominal segment of the host though emergence from the side of the abdomen was not infrequent. The parasites usually freed themselves in a few minutes. Immersion of the host in tap water and a room temperature of 70 F, hastened the emergence of the parasites which always resulted in the death of the host larva.

Although no field observations were made, it is assumed on the basis of the two main types of life-history in the Mermithidae, that the parasites on emergence undergo a last moult, copulation takes place in the soil and eggs are laid which hatch during the warm spring weather. After hatching, the larvae work their way into the host where they undergo further development. During the present study, in few preparasitic stages of the nematode larvae were observed to enter through the fleshy pseudopods of the host.

Mermithid eggs as described by Filipjev and Stekhoven (1941), and Christie (1937), were not seen in about 300 slides prepared with the infected soil for determination of the egg structure. Nevertheless, eggs bearing a close resemblance to the one described by Cobb (1926), were regularly obtained from the infected soil. These eggs and the subsequent free-living stage of the parasite although recorded during the present study are not described pending further examination and rearing to the adult stage.

Larval *Chrysops* are of yellowish-green colour, during early parasitisation this changes to pale-yellow and then black. Parasites could be easily seen in the mature larvae which became transparent owing to the absence of fat body and other tissues, revealing the white coils of the worms. In the immature larvae, the presence of the parasites could only be determined through dissection. Mature larvae were arrested in their development and failed to pupate. Infected larvae did not usually feed and were more sluggish in their movements than normal larvae.

NOTES ON STRUCTURE AND BEHAVIOUR

The largest specimen obtained was 29 mm and the mean length based on 20 specimens was 26.8 mm. Nematodes in multiple infections were

shorter than those of single infections. The following characters were recorded: tail often obtuse, short and conical. In two specimens which survived under laboratory conditions partly buried in the soil for about five months after emergence from the host larvae the spicula were parallel-sided; body colour white due to fat and storage tissue; cuticle smooth and composed of a number of layers; transverse striations present; head portion hemispherical, with six papillae; two amphids present; buccal opening terminal and buccal spear present.

On emergence from the host larvae the parasites were extremely slow moving and remained more or less coiled. They reacted to bright light and showed rapid undulating movement of the body. The nematodes were easily killed when immersed in water for a day or two or when kept in dry vials.

DISCUSSION

Determination of mermithid species is a very difficult task since usually only larval forms are available and these do not possess obvious morphological characters. A correct identification of the larva is only possible if it can be reared to the adult stage. Such rearing experiments have been accomplished only exceptionally by Christie (1937). Dr. H. E. Welch kindly provided continuous help in the matters of identification and according to him the nematode specimens obtained from the larval *Chrysops furcata* belong to the genus *Bathymermis*.

Concerning the biological control of tabanids only a few works have so far reported. Parman (1928) as quoted by Tashiro and Schwardt (1953) claims to have reduced viable tabanid eggs by 50% or more through the use of *Phanurus* (now *Telemonus*) *emersoni*, a hymenopterous parasite in parts of southwest Texas. James (1951) reported that *Diglochis occidentalis* a chalcidoid parasite, was an important agent in the natural regulation of the populations of larval tabanids in northern Manitoba. The results of the present report show a significant role of *Bathymermis* sp., in producing mortality among larval tabanids. The limited data available also suggest that transmission to other related larval host species is possible.

Further experimental work seems desirable to determine the specific nature of the life-cycle, to identify the parasite to the species level, to provide means for maintaining stocks and to ascertain the possible usefulness of the nematode in the biological control of larval tabanids.

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